CLAIMS

What is claimed is:

1. A method of maximizing a communication parameter of a channel between a transmit unit having a number M of transmit antennas and a receive unit having a number N of receive antennas, said method comprising the following steps:

   a) processing said data to produce parallel spatial-multiplexed streams SM_i, where i=1...k;

   b) mapping said spatial-multiplexed streams SM_i to transmit signals TS_p, where p=1...M, for transmission from said M transmit antennas to said receiver via said channel;

   c) receiving receive signals RS_j, where j=1...N by said N receive antennas;

   d) assessing a quality parameter of said receive signals RS_j; and

   e) using said quality parameter to adjust k to maximize said communication parameter of said channel.

2. The method of claim 1, wherein each of said spatial-multiplexed streams SM_i is processed by a coding unit to produce coded streams CS_h, where h=1...k'.

3. The method of claim 2, wherein said quality parameter is utilized in said transmitter to adjust the coding of said coding unit.

4. The method of claim 2, wherein said quality parameter is utilized in said transmitter to adjust k'.

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5. The method of claim 2, wherein said coding unit ~~is selected~~ from the group consisting of space-time coders, space-frequency coders, adaptive modulation rate coders.

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~~6~~. The method of claim ~~5~~, wherein said space-time coders and said space-frequency coders use different coding and modulation rates.

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~~7~~. The method of claim 1, further comprising the step of receive processing said receive signals RS_j to reproduce said spatial-multiplexed streams SM_i.

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~~8~~. The method of claim ~~7~~, wherein said quality parameter is obtained from said receive processed spatial-multiplexed streams SM_i.

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~~9~~. The method of claim ~~8~~, wherein said quality parameter is derived by a statistical unit.

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~~10~~. The method of claim ~~8~~, wherein said quality parameter is selected from the group consisting of signal-to-interference noise ratio, signal-to-noise ratio, power level, level crossing rate, level crossing duration.

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~~11~~. The method of claim 1, further comprising the steps of processing said receive signals RS_j to reconstitute said data and obtaining said quality parameter from said data.

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12. The method of claim 11, wherein said quality parameter is selected from the group consisting of bit-error-rate and packet error-rate.

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13. The method of claim 1, wherein said mapping step further comprises a transmit processing step by a transmit processing block and said quality parameter is used for adjusting the transmit processing of said transmit processing block.

14. The method of claim 1, wherein said quality parameter is fed back to said transmitter.

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15. The method of claim 1, wherein said step of processing said data comprises a technique selected from the group consisting of adaptive modulation, adaptive coding, Space-Time coding, and Space-Frequency coding.

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16. The method of claim 1, wherein said transmit signals TS_p are formatted in accordance with at least one multiple access technique selected from the group consisting of TDMA, FDMA, CDMA, OFDMA.

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17. The method of claim 1, wherein said communication parameter is selected from the group consisting of data capacity, signal quality and throughput.

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18. The method of claim 1, wherein said receive unit and said transmit unit belong to a cellular communication system.

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19. The method of claim 18, used in the downlink of said cellular communication system.

20. The method of claim 16, used in the uplink of said cellular communication system.

21. A communication system with an adaptively maximized communication parameter of a channel in which data is transmitted between a transmit unit having a number M of transmit antennas and a receive unit having a number N of receive antennas, said transmit unit comprising:

a) processing means for processing said data to produce parallel spatial-multiplexed streams SM_i, where i=1...k;

b) antenna mapping means for converting said spatial-multiplexed streams SM_i to transmit signals TS_p, where p=1...M, and transmitting said transmit signals TS_p from said M transmit antennas via said channel;

said receive unit receiving receive signals RS_j, where j=1...N, and said communication system comprising:

a) means for assessing a quality parameter of said receive signals RS_j; and

b) means for adjusting k based on said quality parameter to maximize said communication parameter of said channel.

22. The communication system of claim 21, wherein said means for assessing said quality parameter comprises a statistical unit.

23. The communication system of claim 21, wherein said means for assessing said quality parameter is located in said receive unit.

24. The communication system of claim 21, wherein said means for assessing said quality parameter is located in said transmit unit.

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25. The communication system of claim 21, further comprising a coding unit in said transmit unit for processing said spatial-multiplexed streams SM_i to produce coded streams CS_h, where h=1...k'.

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26. The communication system of claim 25, wherein said means for adjusting k further comprises a mechanism for adjusting k'.

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27. The communication system of claim 25, wherein said coding unit is selected from the group consisting of space-time coders, space-frequency coders, adaptive modulation rate coders.

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28. The communication system of claim 25, further comprising a database of codes and antenna mapping parameters in communication with said coding unit and said antenna mapping means.

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29. The communication system of claim 25, further comprising an adaptive controller in communication with said processing means, said coding unit and said antenna mapping means, said adaptive controller adjusting said processing means, said coding unit and said antenna mapping means based on said quality parameter.

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30. The communication system of claim 21, wherein said means for adjusting k is located in said transmit unit.

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31. The communication system of claim 21, further comprising an adaptive controller in communication

with said processing means and said antenna mapping means, said adaptive controller adjusting said processing means and said antenna mapping means based on said quality parameter.

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32. The communication system of claim 21, said communication system operating in accordance with at least one multiple access technique selected from the group consisting of TDMA, FDMA, CDMA, OFDMA.

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33. The communication system of claim 21, wherein said communication system is a cellular communication system.

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34. The communication system of claim 21 employing multi-carrier modulation.